

Accordingly, LQP recommends that the Commission continue to pursue allocations in multiple bands which would be appropriate for MSS feeder links.⁵⁵

V. THE COMMISSION SHOULD REJECT CELSAT'S PROPOSAL TO RESTRICT APPLICATIONS FOR 2 GHZ MSS TO NON-LICENSEES.

CELSAT's proposal not to allow the Big LEO licensees to apply for 2 GHz MSS licenses must be flatly rejected. CELSAT cites no support for such a restriction, nor could it.⁵⁶ Indeed, in adopting spectrum caps for Commercial Mobile Radio Services, the Commission specifically declined to include MSS spectrum in any spectrum aggregation limit, in part, because of its low yield (capacity per geographic market) and concerns for the effect of international coordination.⁵⁷

The Commission has also declined to take such action prior to review of applications for the specific frequencies at issue. Recently, Final Analysis Communications Services, Inc. (FACS), petitioned the Commission to limit expansion by the Little LEO system licensed to Orbital Communications Corporation (ORBCOMM) until after a second round of Little LEO applicants had been processed.⁵⁸ The Commission rejected that request as premature, stating:

⁵⁵ See LQP Comments, at 24.

⁵⁶ See CELSAT Comments, at 5-6.

⁵⁷ See Regulatory Treatment of Mobile Services (Third Report and Order), 76 RR 2d 326, 386-87 (1994).

⁵⁸ See Orbital Communications Corporation, FCC 95-135, ¶¶ 12-17 (released June 2, 1995).

If all the pending NVNG applications, including those requesting expansion capacity, can be granted, the relief sought by FACS will be unnecessary. If the pending applications are mutually exclusive, the Commission will have to determine the proper method for selecting among the competing qualified applicants. In the course of that proceeding, which will involve the opportunity for notice and comment by interested parties, it would be appropriate to consider legitimate matters of policy such as those raised by FACS. Because FACS will have ample opportunity to advance its arguments regarding access to NVNG spectrum, we deny FACS's Petition.⁵⁹

As in the case of ORBCOMM, the Commission should not even consider imposing arbitrary limits on the amount of spectrum which can be licensed to the Big LEO licensees. Such a restriction is a policy decision which must be considered in light of many factors, such as the number of applicants for specific spectrum, the amount of available spectrum, and the feasibility of co-frequency operation -- all of which are not yet available for review.

Moreover, there is no need to place such a restriction on the Big LEO licensees in order to achieve the competitive marketplace which CELSAT claims as justification for its proposal.⁶⁰ With 70 MHz of spectrum, the Commission can license multiple satellite systems through band sharing or band segmentation. By the time 2 GHz systems are operational, there are likely to be multiple systems already competing for the domestic MSS market. With multiple competing MSS systems, such a restriction would not serve any useful purpose and would, in fact, restrict competition rather than strengthen it.

⁵⁹ Id. at ¶ 17 (footnote omitted).

⁶⁰ CELSAT Comments, at 6.

In any event, it would defy logic to disable Motorola, Loral/QUALCOMM, and TRW from holding licenses for 2 GHz MSS.⁶¹ These three companies have taken the lead in the commercial use of low-earth orbiting satellite technology to provide new and enhanced global services and would be poised to improve such services further with second generation systems by the time the 2 GHz frequencies become available. On the other hand, CELSAT proposes merely to construct another U.S.-only geostationary system, with which it would extend existing terrestrial wireless service. Thus, CELSAT may not even compete in the same market with Big LEO companies providing global service, and there would be no reason to exclude one or the other from eligibility for competitive reasons.

CELSAT's proposal to limit the field of eligible licensees for 2 GHz MSS could limit the usefulness of 2 GHz MSS spectrum and would not promote the most beneficial use of this spectrum. The public interest dictates adoption of policies which lead to improvements in service rather than to limitations on service opportunities. Accordingly, the Commission should accept applications for 2 GHz MSS from all parties which offer proposals which would improve services currently available to the public.

⁶¹ The proposed restriction would, of course, preclude Motorola, TRW and Loral/QUALCOMM from bidding on 2 GHz licenses.

VI. THE COMMENTS PROVIDE NO SUPPORT FOR THE COMMISSION'S INITIAL PLANS TO AWARD 2 GHZ MSS LICENSES BY AUCTION.

The commenting parties were universally opposed to adoption of competitive bidding as the procedure for award of MSS licenses at 2 GHz, and provided multiple reasons why it is not only bad policy but also premature for the Commission to decide to use auctions for 2 GHz MSS licenses. Some of these concerns are:

First, Section 309(j) of the Communications Act of 1934, as amended, authorizes the use of competitive bidding where there are mutually exclusive applications on file. 47 U.S.C. § 309(j). Until the Commission sets a cut-off date for applications and accepts applications for 2 GHz MSS, it cannot determine whether this premise for spectrum auctions would exist. Accordingly, any proposal to use competitive bidding for 2 GHz MSS is premature.⁶²

Second, Section 309(j) also obligates the Commission to attempt to find an engineering solution for mutually exclusive applications prior to use of competitive bidding procedures. 47 U.S.C. § 309(j)(6)(E). Again, this statutory requirement cannot be fulfilled until after applications for 2 GHz MSS have been filed and reviewed.⁶³

⁶² See Teledesic Comments, at 10-11; TRW Comments, at 18-19; COMSAT Comments, at 25-27; Motorola Comments, at 26; PCSAT Comments, at 11-12.

⁶³ See Teledesic Comments, at 11-12; TRW Comments, at 19; COMSAT Comments, at 25-27; Motorola Comments, at 26-27; GE American Comments, at 9-13.

Third, auctions for MSS spectrum are not practical. Unlike PCS, there is no minimum auctionable unit for MSS spectrum which would promote satellite policy goals. For example, awarding exclusive licenses for small spectrum segments limits competition and the benefits of multiple entry, restricts system design alternatives, and could result in warehousing rather than use of spectrum. Moreover, MSS systems using CDMA can share spectrum, increasing the number of providers for service. However, the efficiency produced by sharing spectrum would be discouraged by competitive bidding. An auction also fails to take into account that MSS systems operate across national borders, and the Commission satellite policies must be consistent with international regulation of satellite systems. The Commission has yet to design an auction which would permit both U.S. and foreign applicants to compete on a level playing field.⁶⁴

Fourth, the value of MSS spectrum is difficult to determine, and, therefore, bids would be skewed, which could result in raising less revenue from an MSS auction than is anticipated. As the Commission is aware, MSS systems must be coordinated both domestically and internationally. As a result of this process, the useability of spectrum, and thus its value, could be diminished or eliminated.

⁶⁴ See TRW Comments, at 20; PCSAT Comments, at 14. CEPT noted that it would be concerned if participation were restricted by "nationality of the ownership or registered office of the applicant" and that it "would wish to see the possibility of including European applicants" for U.S. licenses in any auction procedure. CEPT Comments, at 2.

Since this coordination occurs after licensing, bidders would be forced to guess at the value of spectrum segments awarded by auction.⁶⁵

Fifth, U.S. auctions may result in international auctions, increasing the costs of MSS systems. The Commission has recognized that other administrations may follow the lead of the United States in holding auctions for use of MSS spectrum.⁶⁶ Although the Commission has discounted this concern, the commenters here point out that international auctions would substantially increase the costs of U.S. MSS systems, making them less feasible to construct and operate.⁶⁷

Sixth, the escalation in costs resulting from multiple spectrum auctions would make it more difficult for MSS applicants to obtain financing. As Teledesic noted, such a licensing fee based on U.S. precedent would jeopardize the implementation of proposed MSS systems:

Quite simply, the satellite systems proposed to date will require substantial investor commitment around the world. Lining up investors for projects that have completely open-ended capital requirements is highly problematic since financiers will be reluctant to back such projects. Financiers will require a minimum amount of certainty before providing financial backing for a project. The

⁶⁵ See TRW Comments, at 22; COMSAT Comments, at 29; Motorola Comments, at 25; Hughes Comments, at 3-4; PCSAT Comments, at 13.

⁶⁶ Report and Order in CC Docket No. 92-166, 9 FCC Rcd 5936, 5970-71 (1994).

⁶⁷ See Teledesic Comments, at 12-13; TRW Comments, at 22-24; Motorola Comments, at 25-26; PCSAT Comments, at 14.

difficulty to secure financing will jeopardize the development and deployment of global satellite systems.⁶⁸

The commenting parties have made clear that auctions have little to recommend and may impede rather than encourage the MSS industry in the U.S. Moreover, from the international perspective, CEPT noted that competitive bidding raised serious concerns.

We consider that national competitive bidding for access to internationally agreed bands allocated for a world-wide service is at least contrary to the spirit of the ITU Constitution. If such action were to be repeated in other countries throughout the world, it would seriously jeopardize the commercial feasibility of the new MSS networks and consequently the realization of truly global services.⁶⁹

Based on both the domestic and international concerns expressed in the comments, the Commission should defer consideration of competitive bidding for 2 GHz MSS until after it has reviewed applications and attempted to identify engineering solutions for any mutual exclusivity which may exist.

Were the Commission to adopt an auction procedure, LQP recommends that it contain the following elements:

- Any auction procedure should ensure that multiple systems are awarded licenses.
- No one system should be allowed to be licensed for more than half the spectrum to be auctioned.

⁶⁸ Teledesic Comments, at 13; see also PCSAT Comments, at 12-13; Hughes Comments, at 3-4.

⁶⁹ CEPT Comments, at 2.

◦ No geostationary system should be allowed to bid on spectrum which is available for MSS globally.

◦ Winning bidders should be given an opportunity to adjust the spectrum assignments among themselves.

◦ Winning CDMA bidders should be permitted to aggregate spectrum for shared use after conclusion of the auction and any spectrum adjustment.

Adoption of these few principles would ensure multiple entry, competitive MSS and a reasonable opportunity for the spectrum to be used efficiently despite the arbitrariness of licensing MSS spectrum by auction.

VII. CONCLUSION

For the reasons set forth above and in LQP's initial comments, the Commission should continue to pursue the MSS allocation as proposed but should defer consideration of the U.S. allocation until after WRC-95. Any transition plan which may be necessary should be adopted only after consideration and recommendation by a Federal Advisory Committee. Service, technical and licensing rules for MSS at 2 GHz should be considered in the context of actual system proposals.

Respectfully submitted,

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June 21, 1995

ENGINEERING DECLARATION
OF
KLEIN S. GILHOUSEN

ENGINEERING DECLARATION

I, Klein S. Gilhousen, hereby state as follows:

(1) I am presently Senior Vice President for Technology of QUALCOMM Incorporated. QUALCOMM is a limited partner in Loral/QUALCOMM Partnership, L.P., licensee of the Globalstar low-earth orbit satellite telecommunications system. I have a B.S. degree in Electrical Engineering from the University of California at Los Angeles. I am qualified to comment on the matters addressed in "Total Capacity in a Shared CDMA LEOS Environment," by Drs. Vojcic, Milstein and Pickholtz attached to the comments of Motorola, Inc., in ET Docket No. 95-18.

(2) In its initial comments in this proceeding, Motorola, Inc., quotes from documents filed at the Securities and Exchange Commission in connection with Globalstar's public stock offering to support Motorola's claim that proponents of Code Division Multiple Access (CDMA) "recognize the inefficiencies, interference problems and increase costs associated with using such modulation techniques for satellite systems." In the SEC document, Globalstar stated that "Globalstar's capacity over a given area would decrease by approximately 25% if the total number of licensed MSS systems increased from three to four, assuming that Iridium is one of the licensed systems and the two other CDMA systems receiving licenses have technical characteristics similar to Globalstar's and are experiencing the same level of usage."

(3) The capability of CDMA systems to share spectrum and obtain an aggregate capacity increase is a benefit of CDMA compared to TDMA. Consider that if two identical CDMA systems each have capacity C erlangs and total capacity $2 \times C$, and, if each of three such systems have capacity $0.75 C$, then the total capacity is now $2.25 (3 \times 0.75 C)$. The total system capacity has been increased with the additional competitor, all without using any more spectrum. The reason for this is the increased available power. Each system's capacity is primarily limited by power in orbit. An additional competitor puts more power in orbit and so the aggregate capacity of all systems increases.

(4) TDMA does not display similar behavior. Rather, the only viable strategy for band-sharing with TDMA is band segmentation. Band segmentation results in a capacity loss due to erlang blocking similar to the effect in a terrestrial AMPS system where two systems which share 50 MHz on a competitive basis produce less capacity than a non-sharing operator using all the spectrum due to earlier blocking effects.

(5) Motorola also resurrects the argument that CDMA is not inherently more spectrum efficient than other modulation systems and that CDMA does not provide for multiple access without severe capacity limitations. In support of this argument, Motorola attaches a paper by Drs. Vojcic, Milstein, and Pickholtz. The issues raised in this paper have already been thoroughly debated in the FCC's MSS Above 1 GHz Negotiated Rulemaking Committee. Nothing new is presented in the attached paper.

In this analysis, the authors have simply calculated the wrong items. They calculate the capacity of the uplink under an assumed shadow fading model vs number of systems and conclude that a single system offers the highest capacity. Their first error is in not calculating performance using satellite diversity for the uplink. The authors claim that shadowed users will increase power so as to achieve the nominal signal to noise ratio at their own satellite, resulting in increased interference to other systems' satellites. In the Globalstar system, however, all of CONUS is covered by from two to four satellites all of the time. The Globalstar system (unlike Iridium) uses signals from all available satellites resulting in a high order of diversity against shadow fading. In addition to the diversity against shadow fading, multiple links allow capacity to be further

increased by proper combining of signals from all useful satellites.

(6) The authors have apparently assumed that only a single satellite relays useful signals from each mobile earth terminal to the gateway, an assumption that is true for Iridium but not for Globalstar. If an additional Globalstar-like system were to be deployed, the capacity of the uplink will increase proportionally to the number of additional satellites because the additional satellites will relay signals of all users equally well and might as well be properly combined to increase capacity. Moreover, if half the competing systems use a different polarization mode from the other half, even if the polarization isolation is small, most of the intersystem interference is avoided and the capacity greatly increased by the additional satellites. In short, the MSS uplink is not the capacity limited link in a CDMA LEO system.

(7) The authors admit (at p. 239), "It is of interest at this point to note that results for the downlink are fundamentally different from those of the uplink in that capacity improvement is always achieved by sharing on the downlink." Right. They miss, however, the fact that the most important capacity limiting factor is available satellite downlink power from the combined system. With more satellites on orbit there is more power available and, hence, higher capacity.

(8) With TDMA, this does not occur as the system is dimension limited rather than power limited. Furthermore, the TDMA system does not make nearly as efficient use of the power it does transmit because path diversity is not used.

(9) Even if additional satellites did not provide more capacity, the CDMA approach of sharing is superior to the band segmentation approach required for TDMA because CDMA allows the system operator with more customers to have more of the available capacity. The band segmentation approach "fairly" divides the resource into N equal parts but thereby ensures a waste of the resource except in the unlikely case that all N systems have exactly the same load. Even in this case, multiple systems have less capacity than a single system because of erlang blocking losses. With CDMA, a system operator with more customers will automatically take a larger share with nothing going to waste. The division of the resource is not set by regulation but by marketplace success. This benefit is in addition to the well established fact that CDMA with multiple systems offers higher aggregate capacity than CDMA with a single system.

I declare the foregoing is true and correct to the best of my knowledge, information and belief.

Signed this 16th day of June, 1995 in Bozeman, MT.

A handwritten signature in black ink, reading "Klein S. Gilhousen". The signature is fluid and cursive, with a long horizontal stroke at the end.

Klein S. Gilhousen

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Reply
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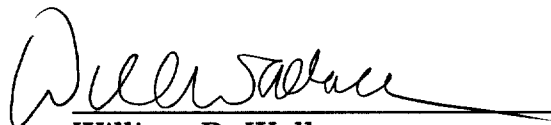
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